Convergence and Divergence in Obsolescence
On Sound Change in Southeastern Pomo

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Previous research on language attrition has distinguished between internally and externally motivated change and between convergent and divergent change, with most literature focusing on speech communities that have undergone either one or the other type of change. In this paper, I argue that these types of change may coexist within the same community or even the same speaker with the result that the obsolescing language becomes simultaneously more similar to and more different from the contact language. The results of a cross-generational acoustic study of Southeastern Pomo (Northern Hokan, Pomoan) indicate that in the domain of phonetics and phonology, the speech of the last fluent generation has converged with English in some ways and diverged from it in other ways.

Keywords: language contact, obsolescence, sound change, convergence, divergence, transfer, approximation

Introduction

The study of language attrition has generally focused on characterizing how and why changes come about in an obsolescing language vis-à-vis earlier, more robust stages of the language. On the one hand, change may occur as a result of external influence from a dominant language in the community; on the other hand, change may arise due to language-internal dynamics having nothing to do with the dominant language. When change is externally motivated by the influence of a dominant language, the obsolescing language may come to approximate features of the dominant language; conversely, external influence may cause salient features of the obsolescing language not found in the dominant language to be enhanced, thus further differentiating the obsolescing language from the dominant language. In other words, externally motivated change may result in either convergence with or divergence from the dominant language. In a similar way, internally motivated change, by virtue of its independence from the influence of an outside language, introduces features into the obsolescing language that may happen to converge with the dominant language or to diverge from it. Whether or

not the change is convergent or divergent then depends upon the nature of the particular languages involved.

Though externally motivated change and internally motivated change are often referred to in terms of a dichotomy of opposing categories, logically they are not mutually exclusive types of change. As Dorian (1993) cautions, it can be difficult to tell whether a particular change in an obsolescing language is due exclusively to external influence from a dominant language, exclusively to language-internal dynamics, or to some combination of external and internal pressures when they would both push the language in the same direction. Furthermore, it is likely for a language to be undergoing changes due to internal pressures at the same time that it is being affected separately by contact with another language; in fact, this confluence of motivations for change "seems to be very common in dying languages" (Thomason 2001: 230).

Given that an obsolescing language may undergo externally motivated changes and internally motivated changes and that both types of change may be convergent or divergent, it stands to reason that it should be possible for an obsolescing language to show both convergent and divergent change with respect to the contact language. Nonetheless, the literature on language attrition has largely focused on cases of either one or the other, rather than on cases of both happening at the same time. In this paper, I argue that these types of change may in fact coexist within the same community or even the same speaker with the result that the obsolescing language becomes simultaneously more similar to and more different from the contact language.

The paper is organized as follows. Section 1 reviews previous research on the phonetic and phonological effects of obsolescence, examining the roles played by the externally motivated vs. internally motivated and convergent vs. divergent dichotomies of change, as well as the delineation of different kinds of convergent change. Section 2 provides some background on the language under study – Southeastern Pomo – and Section 3 describes a cross-generational acoustic study of five speakers, the results of which indicate both convergent and divergent change in the speech of the last fluent speaker. Section 4 discusses the implications of these findings, and Section 5 summarizes the main conclusions.

1. Language obsolescence and its effects on phonetics and phonology

In a survey of many different documented cases of so-called dying languages, Campbell and Muntzel (1989) develop a typology of language obsolescence and the sorts of change processes that can occur in obsolescing languages. The case of Southeastern Pomo is best described by the situation they call "gradual death", in which a language is eventually lost due to increasing bilingualism in a dominant contact language, which eventually comes to be used in all communicative contexts.

In such an obsolescing language, there are three main patterns to be seen in

the types of phonological changes that occur (Andersen 1982: 95). First, fewer phonological distinctions will be made overall than at more viable stages of the language. Second, phonological distinctions common to the obsolescing language and the dominant contact language will be preserved. Finally, phonological distinctions with a high functional load will be maintained longer than those with a low functional load. Although the second and third patterns have to do with the preservation of structure, the first constitutes a loss of structure. In this respect, the type of change instantiating this pattern will most often be convergent with the dominant contact language, since the structure lost is usually one not found in the contact language; through the loss of structure particular to the obsolescing language, the obsolescing language becomes more similar to the contact language. Examples are given in the following section.

1.1. Convergent change

Citing much of Campbell's previous work in this area, Campbell and Muntzel (1989: 186-187) describe many cases of convergent phonological change. One instance is the language Pipil (Southern Uto-Aztecan, Aztecan), whose speakers have for the most part neutralized a vowel length contrast not found in the dominant language, Spanish, leaving just short vowels. In Chiltiupan Pipil, the alveolar affricate [ts] has furthermore merged with the fricative [s]. In the case of Tuxtla Chico Mam (Mayan, Mamean), a contrast between velar and post-velar/uvular plosives, again not found in dominant Spanish, has also disappeared, leaving just velars. In addition, Finnish Americans have been shown not to faithfully produce the vowel length contrast, singleton-geminate consonant length contrast, or front rounded vowels of European Finnish – all phonological features that are absent from the dominant language, English. Goodfellow and Alfred (2002: 215) and Goodfellow (2005: 134-138) document several other examples of convergent phonological change in younger generations of K^{w}aƛ^{w}ala speakers, who have lost several classes of K^{w}aƛ^{w}ala sounds that are absent from English, either omitting them or replacing them with more familiar sounds from English. Glottalized consonants are replaced by plain pulmonic consonants; uvulars are replaced by velars; velar fricatives are omitted; and lateral affricates are replaced by /gl/ clusters.

Campbell and Muntzel (1989) describe these sorts of externally motivated changes as predictable or expected. What they have in common is the loss of structures in the obsolescing language that are not present in the dominant language. Campbell and Muntzel also enumerate several other categories of phonological change that they describe as "of uncertain predictability". Two of these are the overgeneralization of unmarked features and the overgeneralization of marked features.

The overgeneralization of unmarked features can result in the types of convergent change cited above for Pipil, Tuxtla Chico Mam, American Finnish, and K^{w}aƛ^{w}ala. Short segments are indeed less marked than long segments, velars

less marked than uvulars, schwa and back rounded vowels less marked than front rounded vowels, and pulmonic consonants less marked than glottalized consonants. The internal effect of unmarkedness/naturalness and the external effect of a dominant language on the loss of structure are therefore indistinguishable when the structure lost is a marked structure present in the obsolescing language and absent from the dominant language. Either or both of these effects may be responsible for the apparently convergent change. On the other hand, the overgeneralization of marked features normally results in divergent change, examples of which are given in the next section.

1.2. Divergent change

Campbell and Muntzel (1989: 189) cite Jumaytepeque Xinca (isolate) as one case of a marked form being overgeneralized, with the result that the language diverges further from the dominant language that does not have the marked form. In this case, Jumaytepeque Xinca has a rule glottalizing consonants in specific environments, but some speakers have lost this rule and generalized the relatively marked glottalized consonants to all environments over the relatively unmarked plain consonants. Teotepeque Pipil is another example of this kind of overgeneralization. In this case, voiceless [l̥] used to be a word-final allophone of voiced [l], but speakers came to generalize this relatively marked segment to all environments.

Campbell and Muntzel (*ibid*.) state that "[t]hese changes are internal to the structure of the obsolescent language in that they appear to have no direct analog in the dominant language," but Woolard (1989) counters that these sorts of divergent changes may actually be externally motivated: a marked structure not present in the dominant language is exaggerated in the obsolescing language to differentiate it from the dominant language. In this way, the divergent change may serve as a symbolic act of distancing from the dominant language by speakers who want "to emphasize their differentness from the dominant group" (Thomason 2001: 230), a sort of motivation which is reminiscent of the well-known case of vowel centralization in Martha's Vineyard described by Labov (1963). Here, enhancement of the local dialect feature of vowel centralization in the speech of young people correlated with how strongly they identified as residents of Martha's Vineyard: the more strongly they identified as locals, the greater the degree of vowel centralization in their speech.

Thus, it is possible for divergent change to occur in cases of language obsolescence. Nevertheless, convergent change remains the more commonly attested type of change in obsolescing languages, often resulting in the merger of two phonological categories that do not contrast in the dominant language. Given that these sorts of mergers are widely attested, it should come as no surprise that they do not form a homogeneous class. Indeed, one way in which cases of merger have been differentiated from each other is the path by which two phonological categories become one. In this domain, the notions of transfer and approximation

have played an important role.

1.3. Transfer, approximation, and expansion in phonological merger

Trudgill and Foxcroft (1978) introduce the concepts of *transfer* and *approximation* in their analysis of vowel mergers in East Anglia. In the case of transfer, two phonemes merge via the first phoneme categorically changing to the second phoneme in more and more words containing the former phoneme; in this case, the merger is accomplished by the unidirectional transfer of one phoneme to another in a process that "involves…a form of lexical diffusion" (Trudgill and Foxcroft 1978: 73), which is "not consistent with a result that shows an intermediate phonetic form" (Labov 1994: 321). In the case of approximation, however, two phonemes merge as their individual phonetic spaces approach (i.e. approximate) each other; here both phonemes typically shift, resulting in a merged category with a phonetic space intermediate between the original phonemes. According to Labov (*ibid*.), approximation may also result in a merged phoneme with approximately the same phonetic space as one of the original phonemes; similar to transfer, then, the final result in this sort of approximation is not an intermediate phonetic form. In addition to these two merger types, Labov (1994: 321-323) adds a third type, *expansion*, in which the phonetic space of the merged category, rather than being intermediate between the original categories or coincident with one of them, spans the phonetic spaces of both.

These categories of merger figure prominently in an extensive acoustic and articulatory study of Northern Paiute (Uto-Aztecan, Western Numic) carried out by Babel (2007), who documents two kinds of sound change in the language. First, a three-way laryngeal contrast is maintained in each of three generations of speakers; however, the phonetic realization of this contrast differs across generations, and in the youngest generation there is increased subphonemic variation. Second, the place of articulation of the language's sibilant shifts from a palatalized post-alveolar to a plain alveolar (i.e. English /s/), while a more palatalized allophone is replaced by the English palato-alveolar /ʃ/ in the youngest generation. Based upon these results, Babel hypothesizes that contrasts based on timing relationships (e.g. laryngeal contrasts) are more likely to undergo sound change via approximation, while contrasts that are more categorical in nature (e.g. consonantal place contrasts) are more likely to undergo sound change via transfer. Labov (1994: 321) additionally asserts that transfer happens more often when "one form has acquired a social stigma or prestige", the less prestigious form typically transferring to the more prestigious form used in the dominant standard language.

1.4. Other types of sound change

Campbell and Muntzel (1989) review three other types of sound change that can occur in obsolescing languages. First, variability may develop in the application

of phonological rules. Rules that used to be obligatory may apply optionally, show substitutions, or simply be lost. The case of optional rule application usually results in a situation of free variation between forms that have resulted from the rule and those that have escaped it. For example, consonant gradation rules in standard Finnish which voice stop consonants in certain environments are not applied consistently in American Finnish, producing free variation between voiced and voiceless stops in environments where only voiced stops would occur in standard Finnish.

Second, phonological rules may be undergeneralized on the one hand and overgeneralized on the other. In the case of Teotepeque Pipil mentioned above, a rule which devoiced sonorants word-finally has been overgeneralized for /l/, resulting in voiceless [l̥] in all environments, but undergeneralized for /w, j/, resulting in voiced [w, j] in all environments.

Finally, as noted by Labov (1994), foreign phonemes from the dominant language may replace native phonemes in an obsolescing language when the foreign phoneme is more prestigious (and especially when the native phoneme is stigmatized). For instance, the unnatural sound change of /ʂ/ > /r/ in Teotepeque Pipil is most likely attributable to the fact that the former is a stigmatized form in the regional Spanish, whereas the latter is a prestige form. This shift can thus be described as an externally motivated change.

1.5. A case of convergent and divergent change?

Dorian (1993) presents a case of language change in East Sutherland Gaelic that bears some similarities to the change situation in Southeastern Pomo. One of the changes she examines has to do with gender assignment. In East Sutherland Gaelic, which has masculine and feminine gender categories, but no neuter, there has been a change towards extending the use of the masculine third person pronoun /a/ 'he' in substituting for a noun (thus decreasing the use of the feminine third person pronoun /i/ 'she'). The increase in usage of Gaelic /a/ to agree with nominal antecedents parallels the generality of English *it*, and so seems to be an externally motivated change resulting from contact with English. However, it is not the case that nominal gender assignment in East Sutherland Gaelic has generally weakened. On the contrary, the form of English which has had the greatest influence on East Sutherland Gaelic, Northeast Scots, has non-standard features that have the effect of strengthening gender assignment. Though Northeast Scots, like standard English, lacks grammatical gender, it makes greater use of diminutive morphology like the suffix *-ie*, which can be freely added to virtually any monosyllabic noun. Correspondingly, East Sutherland Gaelic, in contrast to other Gaelic dialects, is also characterized by relatively frequent diminutive formation, which takes the form of a suffix that indexes gender information: /-an/ for masculine nouns and /-ag/ for feminine nouns. In this way, gendered diminutive formation has the effect of boosting nominal gender assignment, counterbalancing the gender weakening effect of the pronoun

replacement pattern mentioned above.

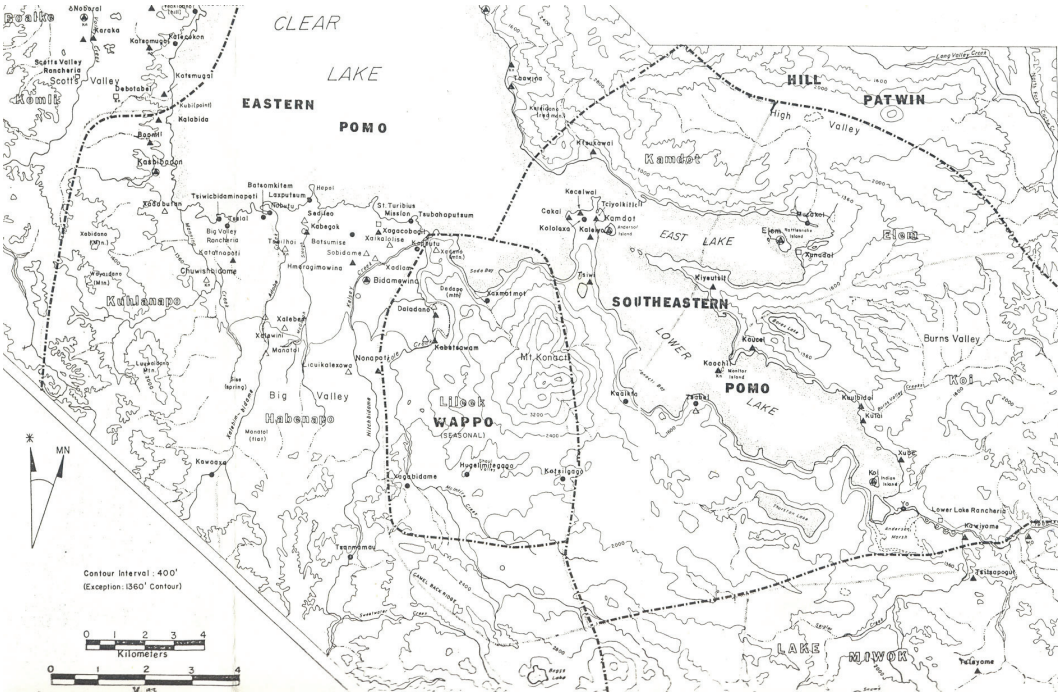
The case of East Sutherland Gaelic thus seems to be an example of convergent and divergent change happening at the same time. On the one hand, the weakening of gender assignment in pronominal replacement is convergent with English; on the other hand, the strengthening of gender assignment in diminutive formation is divergent from English. However, it should be noted that this divergent change is unlike the kinds of divergent change cited above in §1.2 in that it is not externally motivated. Here it is not because grammatical gender is missing in English that it becomes more robust in East Sutherland Gaelic. In fact, grammatical gender is strengthened only because of another convergent change – the increase in diminutive formation paralleling the frequency of diminutives in the contact dialect of English. In this sense, it is simply a coincidence that this change has turned out to be divergent from English. What remains to be seen, then, is whether convergent change and divergent change can co-occur under the same external influences from a contact language, and moreover, whether they can co-occur in the domain of phonetics and phonology. Below I argue that both of these situations obtain in Southeastern Pomo.

2. Background on Southeastern Pomo

2.1. Geography and dialectology

Southeastern Pomo (Northern Hokan, Pomoan), also called Sulfur Bank Pomo, Elem Pomo, and Lower Lake Pomo, is a severely endangered language that was spoken primarily in the area around Clear Lake, East Lake, and Lower Lake in Lake County, California (Moshinsky 1974, Gordon 2005; cf. Figure 1).

Figure 1. Partial map of Lake County, California (from Thompson 1981).



Southeastern Pomo (hereafter, SEP) is not mutually intelligible with the other Pomo languages, such as Eastern Pomo, spoken in the area around Clear Lake including the Big Valley region. Grekoff (1957: 5) notes:

> [T]here is general agreement that the language spoken in Big Valley and that of Sulphur Bank were mutually unintelligible ([Speaker 1E] e.g. SB [xa] 'fish' / BV [ʃa][1]); these people resort to English for intercommunication today… [Speaker 1E] speaks both languages. Father was (according to [Speaker 1B]) a Cherokee, mother Sulphur Bank (?) or other (I don't recall), but he lived in Sulphur Bank and later moved to Big Valley… "Cherokee" apparently a general term for alien Indians…

The literature does not make it clear whether the terms "Sulfur Bank Pomo", "Elem Pomo", and "Lower Lake Pomo" refer to essentially the same dialect or to significantly different varieties, but a few facts suggest that "Sulfur Bank Pomo" and "Elem Pomo" refer to one dialect spoken in the region of Sulfur Bank and Rattlesnake Island in East Lake (cf. Figure 1). First, Moshinsky (1974: 1, fn. 4) notes that Barrett (1908) referred to Rattlesnake Island as *elém*, while Moshinsky's own consultants from Sulfur Bank referred to Sulfur Bank as *elém* and to Rattlesnake Island as *elém mdon* (meaning 'Elem Island'); the word *elém* is thus associated with both Sulfur Bank and Rattlesnake Island. Moreover, a current

1. Throughout this paper, all forms are cited in standard IPA transcription to facilitate comparison between data originally recorded in different transcription systems.

speaker (Speaker 2A, cf. §3.1.1) remembers that Sulfur Bank and Rattlesnake Island used to be one connected land mass. She also refers to the dialect spoken by her father (Speaker 1B), which Moshinsky refers to as Sulfur Bank Pomo, as Elem Pomo. Thus, Sulfur Bank/Elem Pomo appears to be essentially one dialect. This variety may differ to some extent from Lower Lake Pomo, which Speaker 2A recalls as a separate dialect. Moshinsky, however, states that "[d]ialect divergences between Sulfur Bank and Lower Lake seem to be minimal…possibly restricted to a small number of lexical differences" (*ibid*.: 1). It follows that any phonetic differences between these two varieties are probably subphonemic.

2.2. Inventories

Moshinsky (1974: 5) presents a consonant inventory of the language as in Table 1. There are voiceless pulmonic stops at six different places of articulation, including dental/alveolar and velar/post-velar contrasts; glottalic stops ('ejectives') at the same oral places of articulation as the voiceless pulmonic stops; bilabial and alveolar voiced stops; plain and ejective alveolar affricates; voiceless fricatives at every place except dental; bilabial and alveolar nasals; an alveolar flap and lateral; and labial-velar and palatal glides. Plain and ejective palato-alveolar affricates and velar nasals also occur predictably as marginal segments. The palato-alveolar affricates are allophones of the alveolar affricates "when a palatal vowel or glide follows, for some speakers" (*ibid*.: 6), while the velar nasal is "always a product of the Nasal Assimilation Rule" (*ibid*.: 7) that optionally assimilates a bilabial or alveolar nasal in place to a following post-velar stop (*ibid*.: 31-32).

Table 1. Consonant inventory of Southeastern Pomo

	LABIAL	DENTAL	ALVEOLAR	PALATO(ALV.)	VELAR	POST-VELAR	GLOTTAL
STOPS	p p' b	t̪ t̪'	t t' d		k k'	q q'	ʔ
AFFRICATES			ts ts'	(tʃ tʃ')			
FRICATIVES	f		s	ʃ	x	χ	h
NASALS	m		n		(ŋ)		
LIQUIDS			ɾ l				
GLIDES	w			j			

A fair amount of detail is provided about the phonetic implementation of these segments by Moshinsky (1974: 6-7). First, the voiced stops are "fortis in articulation, and voiced throughout their duration", and the ejectives "may be ejected with moderate or considerable force, varying from speaker to speaker." Second, the dental/alveolar contrast is one between an "apico-interdental to apico-dental stop" and an "apico-alveolar to retroflexed apical stop". Retroflexion may also characterize realizations of the voiced alveolar stop. Third, the velar/post-velar contrast may be realized not only by a difference in place of articulation, but

also by the quality of the contact: the "post-velar stop is typically more fortis in articulation, and there may be considerable [χ]-affrication with q, even a failure to effect closure at times. In such instances, especially in word-final position, q is quite difficult to distinguish from [χ]." The velar/post-velar fricative contrast is also cued by features other than place of articulation, the velar having "less fricative noise" and being "accompanied by a spreading and tensing of the lips" (an articulatory adjustment that is likely to slightly shorten the vocal tract and thus have some fronting/lowering effect on the quality of the following vowel). Finally, the lateral "l is always 'light', with no velar co-articulation", and the alveolar flap is marginal, occurring mostly in Spanish loans and often alternating with /d/ or /l/.

The SEP vowel inventory as described by Moshinsky (1974: 5) is given in Table 2. It is described as a basic five-vowel system, with schwa occurring as an epenthetic vowel and length being contrastive. Moshinsky describes the quality of these vowels as "all lax", though he notes a "tendency to tense vowels in word-final syllables."

Table 2. Vowel inventory of Southeastern Pomo

	FRONT	CENTRAL	BACK
HIGH	i		u
MID	e	(ə)	o
LOW		a	

While Moshinsky (1974: 5) includes stress as a contrastive feature, others (e.g. Goodman 1992) have argued that stress is not contrastive, but invariably stem-initial underlyingly, with late processes of epenthesis resulting in surface forms in which an initial syllable is unstressed. Actually, the Stress Placement and Pretonic Vowel Epenthesis rules that Moshinsky (1974: 19, 21) posits seem to indicate that he also adheres to this sort of analysis. Thus, phonological stress may be regarded as a non-contrastive feature of SEP prosody.

The segment inventories found in independent fieldwork[2] largely agree with the above inventories posited by Moshinsky, but they also depart from them in a few significant ways. These divergences constitute some of the sound changes described below.

2. This fieldwork was conducted through a field methods course at the University of California, Berkeley in 2006-2007.

3. An acoustic examination of sound change in Southeastern Pomo

3.1. Methods

3.1.1. Speakers

This study is based upon recordings of four male speakers from the previous generation (Generation 1: Speakers 1A, 1B, 1C, and 1D) and recordings of one current female speaker (Generation 2: Speaker 2A).

Table 3. Linguistic backgrounds of Southeastern Pomo speakers

Speaker	Gender	Origin	SEP dialect	Other languages	Year of Rec.
1A	male	Middletown	Lower Lake	Lake Miwok, English	1956
1B	male	Sulfur Bank	Sulfur Bank	English	1960s
1C	male	Upper Lake	Sulfur Bank	English	1960s
1D	male	Lower Lake	Lower Lake	English	1960s
1E	male	Sulfur Bank	Sulfur Bank	E. Pomo, English	N/A
1F	female	Lower Lake	Lower Lake	English	N/A
1G	female	Sulfur Bank	Sulfur Bank	English	N/A
2A	female	Sulfur Bank	S. Bank/L. Lake	English	2006-07

As summarized in Table 3, Speaker 1B was from Sulfur Bank, and Speaker 1C was from Upper Lake near Sulfur Bank (Moshinsky 1974: v); presumably they both spoke Sulfur Bank/Elem Pomo. Speaker 1A was a Lake Miwok speaker and not a native speaker of SEP; coming from Middletown in Lake Miwok-speaking territory, he would have been geographically closest to Lower Lake, so the variety of SEP he spoke was probably closest to Lower Lake Pomo. Speaker 1D is described by Moshinsky (*ibid.*) as coming from Sulfur Bank, but his niece, who happens to be Speaker 2A, reports that he was from Lower Lake (like his sister and her mother, Speaker 1F) and came to Sulfur Bank by way of marriage to Speaker 1G; thus, he most likely spoke Lower Lake Pomo as well. Like Speaker 2A, all Generation 1 speakers also spoke English.

Speaker 2A is basically the last fluent speaker of SEP.[3] She is dominant in English and learned SEP at home primarily from her mother, with whom she spoke almost exclusively in SEP. According to her, the variety of SEP her mother spoke was Lower Lake Pomo, which she regards as a variety of SEP differing slightly from Sulfur Bank/Elem Pomo (cf. §2.1). Unfortunately, there are no recordings of her mother's speech, although she did serve as a consultant to linguists who worked on the language and is therefore recorded in the field notes of Grekoff (1957) and Moshinsky (1965-1968). Speaker 2A's father, Speaker 1B,

3. Prior to her participation in elicitation sessions, it had been years since Speaker 2A had spoken much SEP due to the fact that there were virtually no fluent interlocutors for her to converse with. Thus, during the first few elicitation sessions, she had some trouble remembering words and was hesitant when asked to provide translations of English sentences. However, repeated sessions have helped to bring back her knowledge of the language, similar to many of the 'last speakers' described by Evans (2001).

usually spoke to her in English, although she remembers hearing him speak to other people in SEP while growing up. She describes her own idiolect of SEP as somewhere in between her father's and her mother's speech.

3.1.2. Recordings

The recordings of Speaker 1A were made by Catherine Callaghan in 1956, and those of Speakers 1B, 1C, and 1D were made by Julius Moshinsky in the late 1960s; in all, they comprise about six hours of elicitation including word lists, sentences, and texts. These recordings were obtained from the Berkeley Language Center at the University of California, Berkeley, where they were converted to a high-quality digital format.

The recordings of Speaker 2A were made by the linguistic field methods course at the University of California, Berkeley in 2006-2007. They were directly recorded in digital format as .wav files using Marantz PMD670 and PMD660 solid state recorders and head-mounted microphones. Virtually all material on these recordings is written down in field notes as well.

To give an idea of the size of the material thus available, the Generation 1 recordings contain approximately 2,200 word tokens from the Generation 1 speakers' word lists, which are each several hundred words long (Speaker 1A: 413 words; Speaker 1B: 208 words; Speaker 1C: 267 words; Speaker 1D: 425 words). The Generation 2 recordings also contain thousands of word tokens from several hours of word elicitation.

3.1.3. Corpus construction

A corpus was constructed from the original recordings in order to compare word forms across the two generations. First, the Generation 1 word lists were searched for overlaps between speakers using the glosses audible after each word (often arranged in alphabetical order). In the case of Speaker 1D, whose recordings do not include any glosses, overlaps with other speakers were postulated based upon the SEP word forms instead of the English glosses, a process that was facilitated by the fact that much of Speaker 1D's word list appears to be arranged in minimal pairs to highlight certain phonological contrasts.

The Generation 2 word list was then searched for overlaps with Generation 1, and words that overlapped were included in the corpus. Words that were missing were elicited, and they were included in the corpus if they showed overlap with a Generation 1 form; otherwise, they were removed. The final result was a cross-generational corpus containing approximately 200 words shared among Speaker 2A and at least two Generation 1 speakers. The full data set is included in Appendix A.

The somewhat high degree of variability in the corpus is reminiscent of the marked variability found by Dorian (2001) among speakers of Scottish Gaelic in Sutherland – variability which was not correlated with social characteristics such as socioeconomic background, age, or sex. From her data she concludes that "social homogeneity need not imply linguistic homogeneity" (*ibid*.: 147) and that

the sort of variability she found is favored under certain conditions: (i) some historical circumstance (e.g. population upheaval) resulting in a range of variants, (ii) a social situation (e.g. small population size, uniform socioeconomic background) preventing particular variants from acquiring social meaning, and (iii) lack of access to standard language norms encouraging normative judgments of certain variants. The SEP situation is similar to that of Sutherland Gaelic in that the population size is small and there has been no prescriptive standardization of the language (in fact, it is only relatively recently that a community orthography was developed). It is not surprising, then, that we find such apparently unconditioned variability in the corpus.

3.2. Convergent changes

There are a number of areas in which the phonological system of Generation 2 shows convergence with the phonology of English. The three case studies presented below focus on the velar/post-velar contrast, the dental/alveolar contrast, and pre-tonic aspiration.

3.2.1. Narrowing of the velar/post-velar distinction

The velar/post-velar distinction is one example of an SEP distinction that is not found in English. As alluded to in §2.2, Moshinsky (1974) observes that velar and post-velar stops may be distinguished not only by place of articulation, but also by quality of contact, the post-velar stop being more fortis in articulation and often affricated or wholly fricated. The velar and post-velar fricatives may also be cued by secondary features, the velar having less noise and occurring with concomitant lip spreading. The notes of Grekoff (1957: 5) seem to concur with these phonetic descriptions:

> In [Speaker 1B's] pronunciation, [x] is relatively free of "salivary" frication, [χ] has more. In [Speaker 1E's] both are with very strong friction. [Speaker 1E] also has a more audible (at times) qualitative difference in the vowels: [xa]/[χɒ] with a fair degree of rounding after the [χ]. The [x]…is not really very far front; the [χ] is extremely retracted.

Since there appear to be secondary cues to the velar/post-velar distinction, the extent to which velars and post-velars are differentiated in Generation 1 vs. Generation 2 was examined through acoustic measures of place of articulation, degree of contact, and vowel quality. The minimal pair examined was /xa/ 'fish' and /χa/ 'water'. To gauge place of articulation, the second resonance (F2) of the fricative noise was measured over the whole fricative interval, as well as the onset of the first formant resonance (F1) in the following vowel. Measures of duration and intensity of the fricative noise were also taken as correlates of the degree of contact. Finally, the quality of the following vowel was estimated via average measures of F1 and F2 over the whole vowel interval.

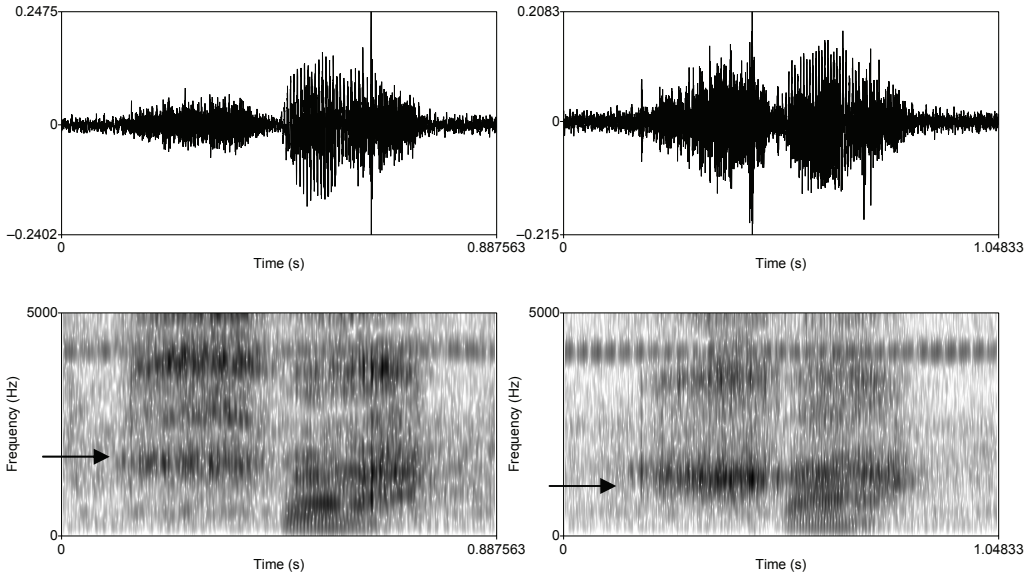
The data collected for /xa/ vs. /χa/ are summarized in Table 4. Note that the data for Speaker 1B and Speaker 1D represent single tokens of /xa/ and /χa/, as only one token of each was available. However, the data for Speaker 1A's /xa/ and /χa/ are averaged over 6 and 4 tokens, respectively, and the data for Speaker 2A's /xa/ and /χa/ are averaged over 14 and 10 tokens, respectively.

Table 4. Average acoustic data for /xa/ 'fish' vs. /χa/ 'water'

	Speaker 1A		Speaker 1B		Speaker 1D		Speaker 2A	
	/xa/	/χa/	/xa/	/χa/	/xa/	/χa/	/xa/	/χa/
Fricative F2 (Hz)	**1212**	**1128**	**1331**	**1066**	**1588**	**1272**	**1488**	**1417**
F1 onset (Hz)	501	519	491	597	572	560	397	378
Duration (ms)	296	253	324	244	326	381	224	258
Intensity (dB)	55.5	56.1	64.5	62.3	58.5	64.8	60.6	60.2
Average F1 (Hz)	791	813	745	816	825	891	569	548
Average F2 (Hz)	1358	1358	1351	1284	1612	1518	1547	1495

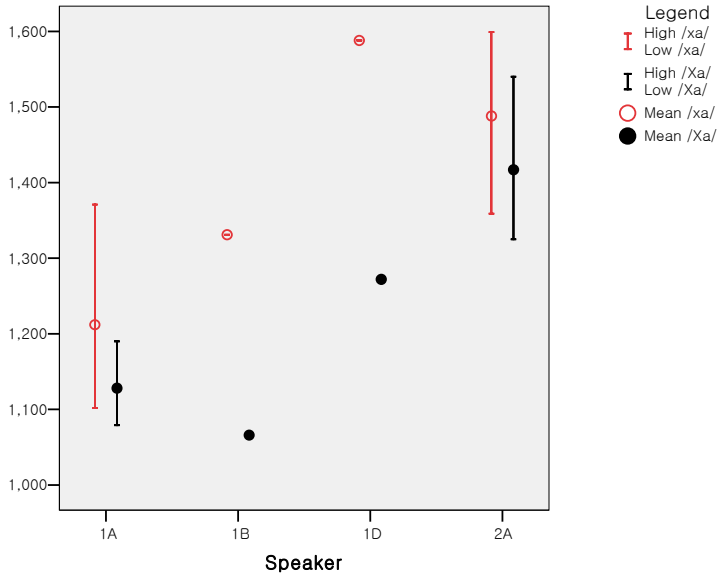
It turns out that the only significant and consistent difference between /xa/ and /χa/ lies in the F2 of the fricative noise, bolded above in Table 4. For all speakers, F2 is lower in the post-velar fricative than in the velar fricative, indicating a more retracted place of articulation. This difference is statistically significant (Speaker 1A: $t[7] = 1.864$, $p = .049$; Speaker 2A: $t[20] = 2.485$, $p = .012$) and is illustrated in Figure 2, where it is clear in the spectrograms that the F2 in /χa/ is lower than that in /xa/. In the waveforms the post-velar also appears to have higher amplitude noise relative to the vowel than the velar, perhaps due to the additional salivary frication noted by Grekoff (1957).

Figure 2. Waveforms and spectrograms of Speaker 1D's /xa/ 'fish' (L) and /χa/ 'water' (R)



Though the post-velar fricative's F2 is on average lower than the velar fricative's F2 for all speakers, the difference between the two is greater in magnitude for all three Generation 1 speakers as compared to Speaker 2A. Speaker 2A has a difference of 71 Hz, while Speaker 1A has a slightly greater difference of 84 Hz. Speakers 1B and 1D, on the other hand, have much greater differences of 265 Hz and 316 Hz, respectively. The fricative F2 data are graphed in Figure 3.

Figure 3. Fricative F2 in /xa/ 'fish' vs. /χa/ 'water' (in Hz)



Since there are only single tokens of the velar and post-velar for Speakers 1B and 1D, it is difficult to conclude how much overlap there is between these two categories. However, the single tokens lie very far from each other—on the order of 300 Hz. As for Speakers 1A and 2A, the difference between velar and post-velar is only slightly greater for Speaker 1A than for Speaker 2A, but there is more overlap between the two categories for Speaker 2A than for Speaker 1A.

This narrowing of the velar/post-velar contrast can be most straightforwardly interpreted as an externally motivated change. There is no similar contrast between dorsals in English; consequently, this contrast is left more vulnerable to loss. It should be noted, however, that the contrast is not lost in Generation 2. It is in fact maintained; the distance between the categories simply decreases.

3.2.2. Narrowing of the dental/alveolar distinction

The dental/alveolar distinction is a second example of an SEP contrast that is not found in English. As summarized in §2.2, Moshinsky describes the dental/alveolar contrast as an opposition between an apical dental stop and an apical alveolar or retroflex stop. He further reports (1974: 8):

> …the dental articulation is typically made by an occlusion extending from the tongue apex, placed directly against the underside of the teeth, and backwards to effect some laminal contact on the front part of the alveolar ridge. The articulation of the alveolar stops, on the other hand, shows less extension along the direction of air flow, varying between a solely laminal occlusion against the central part of the alveolar ridge, to a more apical closure at about the same position, or somewhat further back… Word-finally the plain dental stop may be affricated, producing an easily audible [t$^{\theta}$]. And the alveolar stops…may be considerably retroflexed…

We can expect this sort of contrast to be realized acoustically in two main ways. First, the frequency of the most prominent peak in the stop burst will be higher for a dental than an alveolar/retroflex (Ladefoged 2005: 158-159). Second, the formants in the adjacent vowels will be different due to coarticulation with consonants of different places; in particular, the frequency of the third formant (F3) will be lowered as a result of retroflexion.

The extent to which dentals and alveolars are differentiated in Generation 1 vs. Generation 2 was thus examined through acoustic measures of the stop burst and of vowel quality. The minimal pair examined was [ʔəˈt̪ʼaṯ] 'touch' and [ʔəˈtʼat] 'ruddy duck'. The frequency of the burst peak and the intensity of the burst were measured over the whole burst interval. Formant measurements of both vowels were also taken as averages over the whole vowel interval.

The data collected for [ʔəˈt̪ʼaṯ] vs. [ʔəˈtʼat] are summarized in Table 5. The data for Speaker 1C represent two tokens of each; the data for Speaker 1D represent one token of each; and the data for Speaker 2A represent one token of [ʔəˈt̪ʼaṯ] and two tokens of [ʔəˈtʼat].

Table 5. Average acoustic data for [ʔəˈt̪ʼaṯ] 'touch' vs. [ʔəˈtʼat] 'ruddy duck'

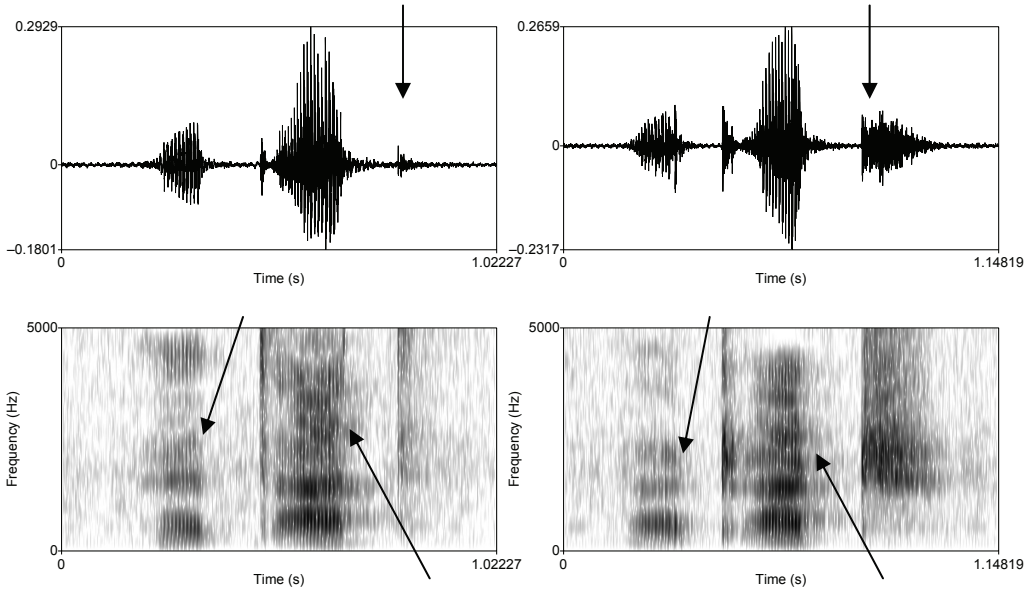
	Speaker 1C		Speaker 1D		Speaker 2A	
	[t̪]	[t]	[t̪]	[t]	[t̪]	[t]
Intensity of ejective burst (dB)	53.6	58.5	67.3	67.1	46.2	44.6
Intensity of plosive burst (dB)	**49.9**	**58.8**	**66.4**	**71.2**	**33.6**	**42.2**
Frequency of ejective burst peak (Hz)	**4304**	**2113**	**4364**	**3422**	**3992**	**3603**
Frequency of plosive burst peak (Hz)	**4705**	**2213**	**4211**	**3831**	**4303**	**3868**
Average F1, first vowel (Hz)	540	568	755	653	500	648
Average F2, first vowel (Hz)	1587	1498	1943	1756	1676	1820
Average F3, first vowel (Hz)	**2456**	**2331**	**3031**	**2898**	2517	2833
F1 onset, second vowel (Hz)	606	586	594	549	752	784
Average F1, second vowel (Hz)	689	661	704	732	608	694
Average F2, second vowel (Hz)	1490	1527	1559	1671	1255	1654
Average F3, second vowel (Hz)	**2602**	**2401**	**2930**	**2480**	**2925**	**2796**

There are several significant and consistent differences between [ʔəˈt̪ʼaṯ] and [ʔəˈtʼat]. First, the burst intensity of the alveolar plosive is significantly greater than that of the dental plosive (Speaker 1C: $t[1] = -5.084$, $p = .018$). Second, as

expected, the frequency of the alveolar burst peak is significantly greater than that of the dental burst peak for both the ejective (Speaker 1C: $t[1] = 12.01$, $p = .0001$) and the plosive (Speaker 1C: $t[1] = 59.091$, $p = .0001$). Finally, F3 is lower adjacent to the alveolar in both the first vowel (Speaker 1C: difference approaching significance at $t[1] = 2.023$, $p = .081$) and second vowel (Speaker 1C: $t[1] = 6.787$, $p = .009$), with the exception of Speaker 2A.

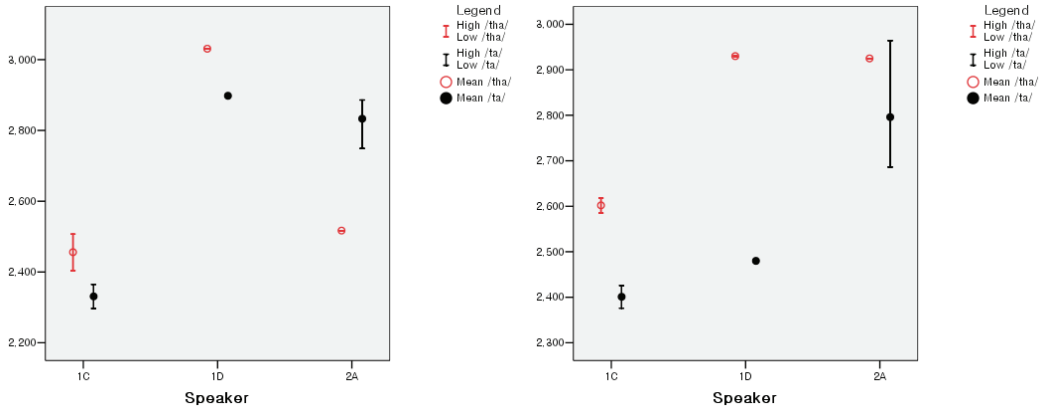
These differences are illustrated in Figure 4. In the waveforms, it is clear that the alveolar plosive burst has greater intensity than the dental plosive burst, while the spectrograms show that F3 adjacent to the (retroflexed) alveolars is lower than that that adjacent to the dentals.

Figure 4. Waveforms and spectrograms of Speaker 1C's [ʔəˈt̪ʼaṯ] 'touch' (L) and [ʔəˈtʼat] 'ruddy duck' (R)



As alluded to above, Speaker 2A patterns a bit differently from Speakers 1C and 1D. Although the magnitude of intensity differences between dental and alveolar bursts in her data is similar to Speakers 1C and 1D, the difference in burst peak frequency for her dental and alveolar ejectives is significantly smaller than for those of Speakers 1C and 1D (389 Hz, as compared to 2191 Hz for Speaker 1C and 942 Hz for Speaker 1D). The difference in F3 in the second vowel is also smaller for Speaker 2A than for Speakers 1C and 1D (129 Hz, as compared to 201 Hz for Speaker 1C and 450 Hz for Speaker 1D). Furthermore, for F3 in the first vowel, Speaker 2A's data goes in the opposite direction of Speakers 1C and 1D, the lower F3 occurring in the case of the dental. The F3 data are graphed below in Figure 5.

Figure 5. Vowel F3 (in Hz) in [ʔəˈt̪ʼaṯ] 'touch' vs. [ʔəˈtʼat] 'ruddy duck', in the first vowel (L) and the second vowel (R)



As seen in the above graphs, the single tokens of Speaker 1D lie quite far from each other. The ranges of Speaker 1C are also significantly differentiated from each other and do not overlap. For both speakers, F3 is consistently lower for the alveolar. In contrast, the pattern for Speaker 2A is the reverse of Speakers 1C and 1D with respect to the first vowel. Moreover, there is overlap between the dental and alveolar with respect to the second vowel.

Like the narrowing of the velar/post-velar contrast, the narrowing of the dental/alveolar contrast is most likely the result of external influence: the absence of a similar contrast in English leaves the native contrast more susceptible to change. Again, however, the contrast is not actually lost, but merely reduced.

3.2.3. Increase in pre-tonic aspiration

Perhaps because aspiration is not a distinctive feature in SEP, Moshinsky (1974) makes no mention of it in his description of the language's phonetics and phonology. However, the voiceless stops of Speaker 2A are heavily aspirated in pre-tonic position. How do Generation 2's voiceless stops compare to those of Generation 1? To answer this question, voice onset time (VOT) was compared between Speaker 2A and each Generation 1 speaker.

VOT was measured from the beginning of the relevant stop burst to the onset of the first glottal cycle in the following vowel. Segment- and word-level effects on VOT were controlled for by comparing VOT for the same segment in the same word. Speech rate effects on VOT were also controlled for in part by measuring the total duration of the word and calculating a ratio of VOT to total word length. Finally, enough measurements were taken to be able to base comparisons between speakers on at least eight word types (many with multiple tokens).

Average ratios of VOT to total word length are presented for each speaker in Table 6. Remember that the higher this ratio is, the more aspirated the stop is relative to the length of the whole word.

Table 6. Average ratios of VOT to total word length (and number of tokens), by speaker

Word	Gloss	Speaker 1A	Speaker 1B	Speaker 1C	Speaker 1D	Speaker 2A
/ʔ**k**a/	'give'	0.165 (4)	---	---	---	0.239 (6)
/ʔ**k**e/	'catch'	0.121 (6)	---	0.170 (2)	0.119 (1)	0.235 (5)
/ʔ**q**ol/	'cradle'	---	0.161 (1)	0.196 (2)	0.133 (1)	0.167 (2)
/b**t**ekat/	'many'	0.057 (2)	0.084 (2)	---	---	0.087 (3)
/b**t**enik/	'big'	0.060 (4)	0.094 (2)	0.092 (2)	---	0.135 (5)
/**k**ahon/	'box'	---	---	0.209 (2)	0.153 (1)	0.186 (2)
/**k**ama/	'bed'	---	---	0.174 (2)	0.158 (1)	0.218 (2)
/**k**awaj/	'horse'	0.121 (2)	---	0.188 (2)	0.174 (1)	0.213 (3)
/**k**ejiṭ/	'laugh'	0.224 (2)	0.181 (1)	---	---	0.228 (13)
/**k**in/	'string'	---	---	0.287 (2)	---	0.267 (12)
/**k**naka/	'sleep'	0.107 (2)	---	0.184 (2)	0.172 (1)	0.188 (4)
/**k**no/	'mountain'	0.150 (2)	---	---	0.241 (1)	0.279 (7)
/**k**ajnu/	'chicken'	---	0.186 (2)	---	0.087 (1)	0.213 (10)
/**k**utsela/	'spoon'	---	0.115 (1)	---	---	0.152 (2)
/**k**wi/	'baby'	---	0.307 (4)	---	---	0.404 (2)
/m**k**oṭ/	'see'	---	0.161 (1)	---	---	0.156 (7)
AVERAGE		**0.126**	**0.161**	**0.188**	**0.155**	**0.210**

On the whole, Speaker 2A aspirates to a greater degree than Generation 1. Although she does not consistently aspirate more than Speaker 1C ($t[7] = -1.079$, $p > .3$), she does aspirate more than Speaker 1A ($t[7] = -5.152$, $p = .001$), Speaker 1B ($t[7] = -2.739$, $p = .029$), and Speaker 1D ($t[7] = -3.992$, $p = .005$). This change is likely externally motivated by the similar pattern of pre-tonic aspiration in English (cf. the difference between the pre-tonic aspirated and post-tonic unaspirated plosives in [ˈ**p**$^{\mathbf{h}}$i.**p**ˌl] 'people' and [ˈ**k**$^{\mathbf{h}}$æ.**k**ˌl] 'cackle').

3.3. Divergent changes

Though there are ways in which Generation 2's SEP phonology has become more similar to English, there are a number of ways in which it diverges from that of Generation 1 such that the language actually becomes less like English. The case studies reviewed below have to do with the elimination of rhotics and the generalization of a variable d-deletion rule.

3.3.1. The elimination of rhotics

Generation 2 differs from Generation 1 in that Speaker 2A's inventory contains no rhotics, whereas flaps, trills, and retroflex approximants are not uncommon in the speech of Generation 1, as shown in Table 7 (phonetic forms given in relatively narrow IPA transcription). Note that while many forms are clearly loanwords (e.g. [ˈpe**ɾ**as] 'pears', cp. Sp. *peras* 'pears'; [ˈto**ɾ**ə] 'bull', cp. Sp. *toro* 'bull'), some,

judging from their semantics, segments, and phonotactics, seem to be native SEP words rather than borrowings (e.g. [ˈkʰɪxɾa] ‘leaf’; [ˈtʼoːkɾutʃkɪt̪] ‘to choke’; [ˈtʼokˠɹokɪn] ‘soft’). Though there are only 1-3 tokens available of each word, the appearance of rhotics is consistent across these tokens; therefore, we can be fairly certain that the forms in Table 7 contain some sort of rhotic phoneme.

Table 7. Generation 1 forms containing rhotic segments

Speaker	Phonetic form	Phonemic form	Gloss	Source[4] (file, time)
1A	ˈkʰusnɛɾu	kusneru	‘cook’	7M4049A, 29:21
1B	ˈʔoɾkeθa	ʔorket̪a	‘fork’	7M2054, 26:02
1B	ˈqʰolˌkʰɾas	qolkras	‘to jump’	7M2054, 20:32
1B	ˈkʰsakˌmtʃʰɪɾə	ksakmtʃira	‘Sunday’	7M2054, 28:40
1B	ˈpeɾas	peras	‘pears’	7M2054, 26:51
1B	ˈt̪oɾə	t̪oro	‘bull’	7M2054, 27:26
1B	ˈwɑɾɪl	wɑril	‘barrel’	7M2054, 25:54
1B	ˈwuɾə	wuru	‘donkey’	7M2054, 28:18
1B	ˈkʰɪxɾa	kikra	‘leaf’	7M2054, 31:02
1C	ˈkʰɪtkʰɹa	kitkra	‘leaf’	7M2055, 27:04
1C	pʰɹəˈmedik	prmedik	‘relative’	7M2055, 18:21
1C	ˈtʼokˠɹokɪn	t’okrokin	‘soft’	7M2055, 28:01
1C	ˈtʼoːkɾutʃkɪt̪	t’oːkrutʃkit̪	‘to choke’	7M2055, 28:05
1D	ˈkʼuɹt̪ʼ	k’urt̪	(unavailable)	7M2056A, 10:17
1D	qʼəˈɹa	q’ra	(unavailable)	7M2056A, 8:15
1D	ˈsɛɹka	serka	‘fence’	7M2056A, 3:42
1D	ˈt̪aɹapu	t̪arapu	(unavailable)	7M2056A, 1:08
1D	ˈt̪ʼoʔɾokʼɪn	t̪’okrokin	‘soft’	7M2056A, 18:11
1D	ˈwʊɾu	wuru	‘donkey’	7M2056B, 1:03
1D	ˈχqʰoɹɑt̪	χqorɑt̪	(unavailable)	7M2056A, 15:10

The fact that Speaker 2A’s inventory lacks rhotics is clear from certain words she has in common with Generation 1 speakers. Table 8 lists examples of words for which a Generation 1 speaker’s form contains a rhotic, while the Generation 2 form contains no rhotic. In each case, the phonetic environment is similar, yet the rhotic is conspicuously absent from the Generation 2 form.

4. These forms may be heard courtesy of the Berkeley Language Center via streaming audio (on Windows Media Player with a fairly recent operating system and Internet browser) at the following address, replacing ‘__’ with the appropriate filename:

mms://langaudio.berkeley.edu/wma/class_media/linguistics240/__.wma

Table 8. Comparison of rhotic vs. non-rhotic forms in Generation 1 and Generation 2

Generation 1 form (speaker)	Generation 2 form	Gloss
ˈʔo**r**keθa (1B)	ˈʔo̤tke̤ta	‘fork’
ˈse**ɹ**ka (1D)	ˈsɛlka	‘fence’
ˈk^{h}ɪtk^{h}**ɹ**a (1C)	ˈk^{h}ikt’a	‘leaf’

Thus, it appears that Speaker 2A’s phonological inventory differs in a significant way from that of Generation 1 in having eliminated all rhotic segments. With regard to how this change might have come about, we can entertain two main possibilities. First, it is possible to attribute this change to external influence from English, a language in which rhotics are abundant. This subtractive change would then be complementary to the additive exaggeration of non-English features that has been reported for other obsolescing languages; however, in this case, not only would rhotics in loanwords have been eliminated to make the language less similar to English, rhotics in apparently native SEP words would also have been eliminated. Second, it is possible to attribute this change to internal forces. Rhotics carry a low functional load in SEP – they occur in only a few native words and otherwise in loanwords and fail to distinguish any minimal pairs – making them vulnerable to loss over time.

The fact that rhotics are lost in an inconsistent manner (cf. Table 8, which shows that /r/ can be replaced by [t̤], [t’], or [l]) suggests that the former analysis is probably right. It appears that, whether consciously or unconsciously, rhotics have been replaced wholesale in the language by other segments that are not so saliently identified as English sounds.

3.3.2. Generalization of /d/-deletion

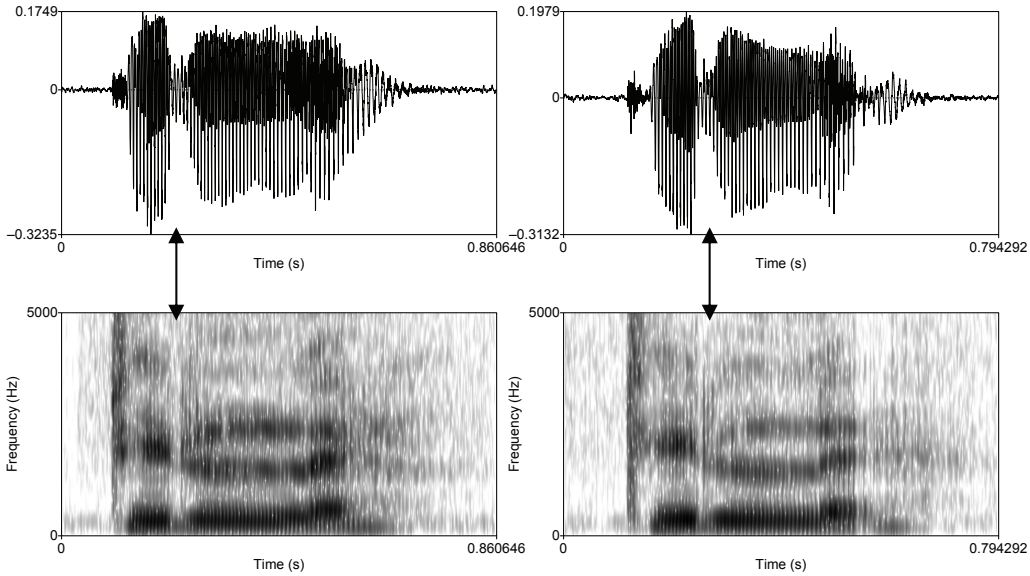
According to Moshinsky (1974: 25-26), SEP has a rule of d-deletion whereby /d/ is deleted preceding another consonant (e.g. /lodt/ ‘my hair is falling out’ → [lot]; /btedlaj/ ‘women’ → [btelaj]). However, it is clear from the speech of Generation 1, particularly Speaker 1C, that this was an optional rule, not an obligatory one. Table 9 lists many examples of forms containing /d/ before another consonant, indicating that /d/ was not necessarily deleted in this environment.

Table 9. Generation 1 forms containing -dC- sequences

Speaker	Form	Gloss	Source (file, time)
1A	ˈtʰi**d̪**l̪e	‘noon’	7M4049A, 14:29
1A	ˈtʰi**d̪**l̪e̞jukin	‘before noon’	7M4049A, 14:00
1A	ˈtʰɪ**d̪**l̪ebə̆˕tonə̆wa	‘afternoon’	7M4049A, 13:49
1C	ʔəˈkʰu**d̪**l̪	‘ridge’	7M2055, 15:43
1C	kʰəˈʔi**d̪**l̪	‘yellow’	7M2055, 16:10
1C	kʰəˈʔo**d̪**l̪	‘honeybee’	7M2055, 26:58
1C	ˈk’ʔi**d̪**l̪	‘meadowlark’	7M2055, 10:54
1C	ˈkʰfi**d̪**l̪	‘poison’	7M2055, 17:14
1C	ˈkʰfi**d̪**n̪	‘mistletoe’	7M2055, 17:19
1C	ˈk’e**d̪**l̪	‘bank, steep slope’	7M2055, 10:49
1C	ˈkʰni**d̪**l̪	‘to pound’	7M2055, 29:56
1C	ˈqʰtʰi**d̪**l̪	‘to lock’	7M2055, 27:30
1C	ˈmkʰu**d̪**l̪	‘log’	7M2055, 26:22
1C	ˈmxu**d̪**l̪xa	‘to put out to dry’	7M2055, 23:14
1C	ˈq’oʃi**d̪**l̪	‘toad’	7M2055, 19:33
1C	ˈq’ʂi**d̪**l̪bu	‘little finger’	7M2055, 20:49
1D	ˈq’oʃi**d̪**l̪	‘toad’	7M2056A, 10:31

That /d/ is actually present in the above forms – that it is not a perceptual artifact related to a slight articulatory mistiming – is apparent from the clear occlusion visible in waveforms and spectrograms of these words, as in Figure 6.

Figure 6. Waveforms and spectrograms of token 1 (L) and token 2 (R) of [ˈtʰid̪l̪e] ‘noon’



Furthermore, it appears that d-deletion could apply optionally within the same speaker, resulting in free variation between forms that maintained pre-consonantal /d/ and those that deleted it. Table 10 lists examples of this variation from Speaker 1C. In each case, one token of the word contains /d/, while the other does not, and the d-deletion occurs in either the first or second token.

Table 10. Free variation in Speaker 1C between forms with and without pre-consonantal /d/

Token 1	Token 2	Gloss	Source (file, time)
kʰəˈʔi**d̩**l̩	kʰəˈʔil	‘yellow’	7M2055, 16:10
kʰəˈʔo**d̩**l̩	kʰəˈʔol	‘honeybee’	7M2055, 26:58
ˈkʰfi**d̩**n̩	ˈkʰfin	‘mistletoe’	7M2055, 17:19
ˈqʰtʰil	ˈqʰtʰi**d̩**l̩	‘to lock’	7M2055, 27:30

What was once an optional rule has become obligatory for Speaker 2A. There are no instances of pre-consonantal /d/ in her speech, which can be seen most clearly in words she has in common with Generation 1 speakers. Table 11 shows that for words in which the Generation 1 form either has a pre-consonantal /d/ or alternates between having the /d/ and deleting it, Speaker 2A’s form invariably deletes the /d/.

Table 11. Comparison between Generations 1 and 2 with respect to pre-consonantal /d/

Generation 1 form (speaker)	Generation 2 form	Gloss
ˈtʰi**d̩**le (1A)	ˈt̪ʰɪlɛ	‘noon’
ˈtʰɪ**d̩**lebə̆ˌt̪ʰonə̆wa (1A)	ˈt̪ʰɪlɛbə̆ˌt̪ʰonwa	‘afternoon’
ˈtʰɪ**d̩**leˌjukin (1A)	ˈt̪ʰɪlɛˌjukɪn	‘before noon’
kʰəˈʔi**d̩**l̩ ~ kʰəˈʔil (1C)	kʰəˈʔil̪ʼo	‘yellow’
ˈkʼʔi**d̩**l̩ (1C)	kʰəˈʔil	‘meadowlark’
jʊ**d̩**l (1F, 1G)	jul	‘snow’[5]
ˈkʰʔo**d̩**l̩ (1C)	kʰʔol	‘honeybee’
ˈkʰtʰi**d̩**l̩ (1C)	kʰtʰil	‘to lock’
ˈkʰfi**d̩**l̩ (1C)	kʰfil	‘poison’
ˈmxu**d̩**lxa (1C)	ˈmxulka	‘to put out to dry’

In short, Speaker 2A has generalized an optional rule, obligatorily deleting /d/ before another consonant. This change seems to be internally motivated. Influence from English is unlikely to be responsible for this change, as there is no comparable ban on pre-consonantal /d/ in English (cf. words such as *addle*, *paddle*, *madden*, *redden*, *ridden*, *fiddle*, *riddle*, *coddle*, *cuddle*, *idle*, *sidle*, etc.); moreover, there is no clear analog in English to the d-deletion rule that has been generalized.

5. These data for Speakers 1F and 1G are from the field notes of Grekoff (1957: 19, 80).

4. Discussion

To summarize, data collected in five cross-generational case studies of SEP phonetics and phonology suggest that convergent change and divergent change can exist simultaneously within the same speaker. On the one hand, the narrowing of velar/post-velar and dental/alveolar contrasts and the enhancement of pre-tonic aspiration are convergent with English and likely due to this external influence. On the other hand, the elimination of rhotics from the consonant inventory and the generalization of a SEP-specific d-deletion rule are divergent from English. The elimination of rhotics seems also to be a reaction to external influence from English, while the generalization of d-deletion is probably the result of language-internal factors.

Before discussing these results further, we should more firmly establish their validity. How sure can we be that the phonetic and phonological differences found are due to diachronic change rather than simply correlated with gender or dialect? First, we can be fairly certain that the data cannot be blamed on dialectal differences, at least in large part. The Generation 1 speakers analyzed in this study come from both major dialect groups, yet the differences found between Generation 1 and Generation 2 are not correlated with this variable. It is not the case, for instance, that the Lower Lake speaker, Speaker 1D, also happened to lack rhotics like Speaker 2A, or that the Sulfur Bank speakers all patterned together with or against Speaker 2A in a particular dimension.

We cannot be so sure about gender. It is an unfortunate fact that all of the recordings available of Generation 1 speakers are of males, while the only Generation 2 speaker is female. It is possible that Speaker 2A patterns differently from Generation 1 speakers because females and males say things differently in SEP, and she is just producing the female version. Though the possibility of gender effects remains, they cannot be responsible for the generalization of d-deletion presented in §3.3.2. In this case, data from other female speakers (1F and 1G) pattern with the Generation 1 male speakers, not with the Generation 2 female speaker. Thus, the data collected in this study cannot be written off wholesale to gender effects, either.

More specifically, we might want to re-consider the divergent changes presented in §3.3. With regard to the elimination of rhotics, there are at least two possibilities regarding the presence of rhotics in Generation 1 and absence of rhotics in Generation 2. In the first scenario, we would posit that (i) rhotics were never in the inventory, (ii) there was a significant amount of individual variation with respect to rhotic realizations of certain words, and (iii) the particular Generation 1 speakers analyzed here all happened to have some rhotic forms. In this case, the absence of rhotics in Generation 2 would be an original state of sorts rather than the result of sound change; the presence of rhotics in Generation 1 would then be an artifact of the sample size. In the second scenario, we would need to assume that (i) rhotics were either an original part of the inventory or

entered the inventory early on due to language contact, and (ii) they were then lost in Generation 2.

Two points favor the second, simpler analysis. First, whether or not rhotics were restricted to loanwords, they must have been fairly common for Moshinsky (1974) to include them in his consonant inventory, a fact that casts some doubt on the idea that there were many Generation 1 speakers who lacked rhotics entirely. Second, assuming that such speakers were common in Generation 1, it becomes highly improbable that of the four speakers on the recordings, not one would turn out to be one of these rhotic-less speakers, especially considering the fact that they were from different areas.

One might return to the gender issue to counter that (i) rhotics are not a standard part of the inventory, (ii) female speakers tend to conform more to the standard variety of a language, and (iii) Speaker 2A is female. This is a possibility that we cannot fully discount due to the unavailability of extensive recordings of other female SEP speakers. However, it is clear from the data that rhotics appear in native SEP words and not just in loanwords that have not been fully integrated into SEP phonology.

In fact, comparative evidence from other Pomo languages shines some light on the possibility that there were original rhotics in SEP. McLendon (1973) includes rhotics in the inventories of Northeastern Pomo as well as Eastern Pomo, the Pomo language most closely related to SEP. In addition, one correspondence set she cites in particular suggests an alternation between /r/ and /l/—the Pomo words for ‘leaf’. The forms in all seven Pomo languages as cited by McLendon are summarized in Table 12 below.

Table 12. Comparison of Pomo forms for ‘leaf’ (McLendon 1973: 79)

Proto Pomo	Kashaya Pomo	Northern Pomo	Central Pomo	Northeastern Pomo	Eastern Pomo	Southeastern Pomo
*siʔt’ál	siʔt’al	si̯t’ál	st’ál	túʔt’a	si:t’ál	kiqt’a

McLendon (1973: 79) notes that the “lack of a reflex for *-l in [Northeastern Pomo] and [Southeastern Pomo] perhaps indicates that this *-l was a separate, segmentable morpheme in Proto Pomo”, but it appears *-l might actually have had a reflex in SEP—namely, a rhotic. Compare the forms in Table 12 with the Generation 1 SEP forms for ‘leaf’: [kixɾa] (Speaker 1B) and [kitkɹa] (Speaker 1C). If this *l ~ r correspondence is legitimate, it further strengthens the argument for original rhotics in SEP.

As for the other case of divergent change, the generalization of d-deletion raises interesting questions about the stability of truly free variation. Campbell and Muntzel (1989) mention examples of previously obligatory rules becoming optional in obsolescence and resulting in free variation, but they do not present any cases of rules changing in the opposite direction—optional rules becoming obligatory ones. The former situation fits well into the notion of an obsolescing

language being imperfectly learned in that it is subtractive: a language structure is being forgotten or omitted. The latter situation, on the other hand, is additive: a rule of ambiguous status is being regularized such that it can be applied all the time.

Of course, the generalization of d-deletion is a perfect example of an optional rule becoming obligatory. It seems the factors leading to this change might not be internal to the language so much as universal across languages. In many ways, truly free variation is a problem that is difficult to solve for learners predisposed to associating a difference in sound to a difference in meaning. How do they cope with a difference in sound when they cannot associate it with a difference in meaning? One solution is just to eliminate the difference in sound—take account of all the variants, pick one, and stick to it. Perhaps this sort of motivation underlies the generalization of the SEP rule.

The findings of Hudson Kam and Newport (2005) lend support to this hypothesis. In this study, adults and young children were compared with respect to how they acquired unpredictable grammatical variability in an artificial language. Hudson Kam and Newport found that adult learners of the artificial language reproduced the pattern of variability they were exposed to in the input. However, many of the child learners, rather than reproducing the variability of the input like the adults, instead regularized the language. Thus, children's predisposition to constructing a grammar of regular patterns – often cited as a driving force behind the formation of creole languages – may account for the generalization of d-deletion seen in Generation 2.

With regard to the convergent changes discussed above, it remains a question what route to merger the narrowing of SEP contrasts is following. Babel (2007) presents a case of place contrasts undergoing merger via complete and rather rapid transfer in Northern Paiute, but in the case of SEP, the change appears to be slower and more gradient. Both the velar/post-velar and dental/alveolar contrasts are actually maintained despite being lessened in degree. What seems clear is that the road to merger in the case of SEP is not one of transfer as argued by Babel (2007) for Northern Paiute, but rather one of approximation, since there indeed seems to be an intermediate phonetic form in this case. The dental/alveolar contrast, for instance, is diminished by way of the retroflexed alveolars of Generation 1 approaching the dentals in becoming non-retroflex in Generation 2. On the other hand, the dentals themselves maintain robust dental contact and do not move back in place of articulation, so it seems that if the two categories were to fully merge in the future, the result would be a merged category with approximately the same phonetic space as the dentals.

5. Conclusion

In contrast to previous linguistic studies focusing on the occurrence of either convergent or divergent change in obsolescing languages, this paper has argued,

using phonetic and phonological evidence from Southeastern Pomo, that it is possible for these different types of change to occur simultaneously within the same speaker, resulting in the obsolescing language both converging with and diverging from the contact language under the same sort of external influence. Though these findings are based on data from one language, they suggest that the case of simultaneous convergent and divergent change is likely to be more common than the literature reflects.

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Appendix A. Cross-generational corpus

Speaker 1A	*Speaker 1B*	*Speaker 1C*	*Speaker 1D*	*Speaker 2A*	*Gloss*
bdu	ʃoʔo	---	ʃʔo	bdu ‘acorn’ ʃoʔo ‘acorn drink’	acorn
xulmuxat	xulukaliṭ	---	---	xumkaṭ	afraid
---	---	somqaṭ	somgaṭ	somq’ats’	ant
ʔapal / mnsana	ʔapal	---	---	ʔapal	apple
xal	---	---	xal	xal	arm
bʃi	bʃe	---	---	bsi	arrow
xojonoxo	χoloχa	---	χojonoχo	xojonoxo	ashes
---	t’ilegodaj	tsenakotaj	t’inakotaj	ts’inak’otaj	bad
ʃokdam	ʃokdam	---	ʃoxdam	ʃokdam	basket
---	---	ṭ’ak^{h}ala	ṭ’akala	t’ak’ala	bat
btexal	---	bteqal	---	btekal	bear
---	---	kama	kama	kama	bed
ko	---	qo	qo	qo	belly
btenik	btenek	btenik’	btenek / btenik’	btenik	big
---	qneṭ	qne	qne	kneṭ	bite
lk’olk’okin	---	lk’olk’okin	lq’olqok’in	lq’olq’okin	black
ts’its’ik’ob	---	tsitsik’ob	ts’itsikob	ts’its’ik’ob	blackberry
kʔafal	---	kʔapalam	---	kʔafal	blackbird
---	---	χqal	χqal	χqal	blackfish
blaj	---	---	blaj	blaj	blood
xna	---	---	xna	xna	boat
xba	---	xba	xba	xba	body
---	---	qmaṭ	qmaṭ	nemaṭ	born, to be
hintilk’ot	ʔkot	ʔk’ot	---	hintilʔkot	bow (with arrow)
---	---	kahon	kahon	kahon	box
kto	xto	kṭo	kto	kto	bread
---	solgiṭ	kʃak	kʃak	ksolki ‘break’ kʃak ‘shatter’	break, to
---	---	xk’abki	xk’abki	k’abki	break in, to
xdon	---	---	xdon	xdon	breast
xol	---	---	xol	xol	bug
kʃima	kʃilaṭ	---	---	kʃima	burn, to
mʔi	mʔith	---	---	mʔiṭ	buy, to
---	---	kʃajki	kʃajk’idiṭ	kʃajkidiṭ	camp, to
---	---	qlaq	qlak	qlaq	capture, to
---	---	xbu	xbu	xbu	carrot
ʔke	---	ʔkeṭ	ʔkeṭ	ʔke	catch, to
---	---	kaʃki	kaʃkiṭ	kaʃki	cave in, to
wanku	---	wanko	---	wanko	chair
kdela	tsaχdakaṭ	---	---	kdela	chew, to
kajno	kajno	kajena	kajna	kajnu	chicken
---	balakwi	balakwe	balak’wi	balakwi	chief
kwi	qwi	qwi	qwi	kwi	child, baby

χbu	---	χbu	χbu	xbu	cloud
---	tapuṯedudedum	kaboṯe	k'aboṯe	kaboṯe	coat
ksiliṯ	ksiliṯ	ksiliṯ	ksiliṯ	ksiliṯ	cold
xolo	xoloṯ	---	χoloja	xolo	come, to
---	---	nomikx	nomejk	nomik	cottontail rabbit
kjamts'i	qejamsiṯ	kjamtsiṯ	kjamts'i	kjamts'i	count, to
paka	paka	---	---	paka	cow
---	ʔkol	ʔkol	ʔkol	ʔqol	cradle
xakaṯ	xagaṯ	---	---	xak'a / xaka	cry, to
k'etski	k'etskiṯ	ʔk'etski	ʔk'ets'ki	ʔk'etski	cut, to
q'laliṯ	q'laliṯ	q'lal	q'lal / q'laliṯ	q'lal	dead, sick
noxo	---	---	noχo	noxo	dirt
χq'owi	---	χq'owi	---	χq'owi	doctor
ʔʃama	---	stibakse	stibaktse	stibaktsi	dress up, to
bts'aka	mts'akiṯ	bts'ak'a	bts'aka	bts'ak	drink, to
ts'liṯki	ts'lidiṯ	---	---	ts'leṯiṯ	drip, to
q'bokiṯ	q'bokiṯ	---	---	k'bokin / q'bokiṯ	dry
xmantsa	xmantsa	---	xmantsa	xmantsa	ear
χqo	χo	χqo	χqo	χqo	earth
kwala	kwaliṯ	---	---	kwal	eat, to
k'o	---	k'o	k'o	k'o	egg
---	---	lokoja	loqoya	loq'oja	elk
---	---	ʔuko	ʔuk'o	ʔujk'o	eye socket
ʃakiṯ	ʃakiṯ	---	---	tʃlaka / ʃakiṯ	fall down, to
ʔimek	---	ʔimek'	ʔimek' / ʔimeq	ʔimek	father
ʔi	---	ʔi	ʔi	ʔi	feather
---	---	selka	seɹka	selka	fence
ʔbediṯ	ʔqoliṯ	---	---	ʔbetiṯ	finish, to
xo	xo	---	---	xo	fire
xa	xa	---	xa	xa	fish
xa 'fish' xaj 'stick'	---	xaχaj	xaχaj	xaχay	fish spear
tsukuj	---	ʦukuj	tsuk'uj	tsukuj	flower
χbanaṯ	---	χba	χba	xbu	fog
qwa	kwa	---	qwa	kwa	food
q'a	---	q'a	q'a	q'a	foot
ʔotketa	ʔorkeṯa	t'ukam	t'ukam	ʔoṯkeṯa	fork
dako	---	dako	daqo	dako	four
fqats	---	fχats	---	fq'ats	frog
xaṯemaṯ	χaṯemaṯ	qokmokiṯ	χaṯemaṯ / qomokiṯ	xaṯemaṯ / koʔmokiṯ	full
---	---	qwaχqo	qwaχqo	kwaxko	garden
ʔqa	hoqaṯ	---	---	ʔka	give, to
tsiwo	tsiwo	---	---	tsiwo	goat
ts'ma	ts'ma	---	---	ts'ma	good
---	mka	mka	mq'a	mka	grain
---	---	ʔimqa	ʔimqa	ʔimxa	grandmother
xebxaj	xebxaj	---	---	xebxaj	grapes

ts'jats'jakin	tʃjatʃjakin	---	---	ts'jats'jakin	green
---	xdikiṭ	---	xdikiṭ	xdikiṭ	hard to do
samlelo	somlelo	---	---	samlelo	hat
qts'a	---	qts'a	kts'a	kts'a	hay
xja	xja	k'bel	xja / q'bel	xija / q'bel	head
xkoṭ	xkoṭ	---	χqoṭ	xkoṭ	hear, to
bde	xtowkiṭ	---	kṭ'okiṭ	nema	hit, to
---	kote	kotʃi	k'otʃi	kotʃi	hog, pig
---	---	k?odl	k?ol	k?ol	honeybee
kawaj	---	kawaj	kawaj	kawaj	horse
mṭ'ekiṭ	mt'ekiṭ	---	---	mṭ'ekiṭ	hot
tsa	tsa	---	---	tsa	house
heχat?e	---	heqat?e	---	hekat?e	how
kli	---	kli	kle	kli	hummingbird
qwaχatsiṭ	---	χwaq'adiṭ	---	kwaxatsiṭ	hungry
boṭ	boṭ	---	---	boṭ	hunt
?ʃaliṭ	?ʃalxtiṭ	---	---	?ʃaliṭ	hurt, sick
ts'iṭki / tsaka	qolkras	---	---	tsiṭki	jump, to
ktsa	---	ktsaṭ	ktsa / k'tsaṭ	k'tsaṭ	kick, to
mdoxa	mdohaṭ	mndoxaṭ	mdoχaṭ	mdokaṭ	kill, to
---	---	k'da	k'da	k'da	knee
kutʃija	kutʃija	---	---	kutʃija	knife
---	nexaṭ	fdiqaṭ	---	fdikaṭ	know, to
qeja	qejiṭ	---	k'ejiṭ	kejiṭ / keja	laugh, to
---	kixɾa	kitkɪa	---	kikt'a	leaf
?apk'otal	?apata	?abk'atal	?abk'atal	?abk'atal	lie, liar
---	---	xkobki	xkobki	χqobki	listen, to
---	---	qtidl	ktil	ktil	lock, to
---	---	χqoji	χq'oje	χqoji	Lower Lake
btegat	btexat	---	---	btekat	many
k?ilt'o 'yellow'	k?iḷto 'yellow'	k'?idl	k'?il / k?il	k?il	meadowlark
xbe	xbe	---	χbe	xbe	money; stone
kno	---	kno	kno	kno	mountain
k'ot	---	k'ot	k'ot'	k'ot	mouse
xasto	xasto	---	xasto	xasto	mouth
---	---	wimtak	wimdaχq	wimdek	my sister
---	---	χqoj	χq'oj	χqoj	naked
k'oj	---	---	k'oj	q'oj	neck
?awha	?alma	---	---	?awha	needle
hutpaʃem	hutpaʃem	---	xut'paʃem	hotpaʃem	nine
hele	he?e	---	---	hele / he?e	no
xoʃel	---	---	xoʃel	xoʃel	nut
---	---	xkal	xkal	xkal	paddle, to
---	bajbok	qaboq	---	k'aboq	pants
mnakiṭ	mnakiṭ	---	---	mnakiṭ	pay, to
---	---	?ʃuqam	?ʃuq'am	?suqam	pencil
skun	skun 'mortar'	skun	skun	skun	pestle

pilaṭu	pilaṭo	---	---	pilaṭo	plate
nawaha	nawha	---	---	nawha	pocketknife
---	---	kfɨdl	k’fɨl	kfɨl	poison
---	---	kdika	kdikiṭ	neṭki	push, to
---	---	mxudlxa	mxulχa	mxulka	put out to dry, to
bunbun ts’ita	---	χqaq	χqaq	χqaq	quail
t’ant’ankin	t’ant’ankin	---	---	ṭ’anṭ’ankin	red
---	---	xwal kitolkija	xwal ktolk’i	k’otal ktolki	remove bark, to
ksaka	---	ksak	---	ksak	rest, to
ʃotid	ʃotiṭ	---	---	ʃotin	rotten
---	---	ʔt’at	ʔt’at	ʔt’at	ruddy duck
q’waka	q’lakiṭ	---	k’wakiṭ	q’waq	run, to
---	hostela	kostala	koṣtala	koṣtala	sack
---	ts’ṭ’a	sija	sija / ts’ṭa	sija	saddle
---	tseja	sja	sja	sja	salt
---	---	ktokit	kṭ’okiṭ	kṭokiṭ	shallow
---	woleha	woleka	woleka	weleka	sheep
---	ʔamisa	kamesa	kamesa	kamesa	shirt
---	fut’ukin	q’utki	---	k’utki	short
mkoxa	mkoxaṭ	mkoq	mkoq	mkoq ‘sound’	shout, to
xenola	χqoleṭ	---	---	xenola	sing, to
---	---	kt’alki	kt’alki	kt’alki	slap, to
qnaq’a	xlakiṭ	knak’a	knaka	knak’a	sleep, to
---	---	kalseta	k’alseṭa	kalsita	socks
---	---	xe	xe	xe	song
mts’akiṭ	mts’akiṭ	---	---	mts’akiṭ	spicy, pepper hot; bitter; sour
ksoseṭ	---	ksus	---	ksosiṭ	spoiled
---	kutsela	kutsela	k’utsela	kutsela	spoon
---	---	χaqfa	χaqba	xakfa	spring
---	---	knaṭ	knaṭ	knaṭ	stained
ts’ɐkajkujkuj	---	ʔojtsexajk’ujk’uj	ts’exajk’ujk’uj	sexajk’ujk’uj	star
---	---	jok’lil	jok’lel	jok’lel	steep
xaj	---	---	χaj	xaj	stick
---	---	mokto	mokto	moqto	stop, to
---	---	kin	kin	kin	string
t’oka	t’okiṭ	---	---	t’oka	suck, to
---	---	k’un	k’un	k’un	sucker fish
mqabats	mqajṭ	mq’abats	mk’abaṭ / mŋk’abats	mq’abats	sugar
---	ʔqajṭ	mqajiṭ	mqaj	mkajin	sweet
---	---	xkoxsiṭ	xkoxtsiṭ	xkoktsiṭ	taste, to
xokat	---	xokat	xoxat	hokat	three
t’omxwa	t’amkwa	t’amquwa	t’amkowa	ṭ’omkwa	tobacco
xʔano	---	---	χʔano	xʔano	tomorrow
---	---	ʔṭ’aṭ	ʔṭ’aṭ	ʔt’aṭ	touch, to
xle	xle	---	xle	xle	tree
---	---	tsoktsok	tsoxtsoxki	tsoxtsoxki	trot, to

---	ʔokilaṭa	wokleto	woq'loṭo	woqloto	turkey
xos	xos	---	---	χos	two
χa	χa	---	χa	χa	water
ft'ika	ft'igiṭ	ft'ika	ft'ika	ft'ika	whip, to
ṭ'oṭ'okin	ṭ'oṭ'okin	---	---	ṭ'oṭ'okin	white
χq'o	---	χq'o	χq'o	χq'o	white man
tsaka	t'eʔek	---	---	t'eʔek	wide
---	---	kʃaxaj	kʃaxaj	ksaxaj	wild sunflower
kʔilt'o	---	kʔidl	k'ʔilto	kʔilṭ'o	yellow
bkotat	---	kotat	bk'ot'at	bkotat	yellowhammer
---	---	k'ʔol	k'ʔol / kʔol	kʔol	yellowjacket
---	ʔi	ʔej	ʔi:	ʔi:	yes
xexmat 'young man'	---	xeqlak	xexlak	xexmat	young people